Detection and Quantification of Some Biomolecules in Live Cell by Newly Designed Chemosensors

The concept of molecular recognition is fundamentally important both in chemistry and biology. The specific recognition process is responsible for many chemical, biological and material properties of large and small molecules. Recognition of nucleotides and their derivatives with abiotic synthetic receptors has great significance to understand the enzymatic reactions (enzyme-substrate interactions), immunological reactions *in-vivo*, selective host-guest complexation and catalytic reactions in bio-mimetic chemistry. The weak intermolecular forces in recognition system direct the molecules towards self-linking in supramolecular engineering in the chemistry of life and material science. The designed receptors are based on the choice of different fluorophores as spacers which can accommodate the guest molecules by intermolecular hydrogen bonding. It is important to understand the goal of developing artificial molecular receptors, capable of binding very efficiently and very selectively with such biomolecules. The modern bioorganic chemistry concerns the design of synthetic molecules that mimic various aspects of enzyme chemistry and to understand their essential roles in biological systems.

DNA nucleobase recognition by small molecules has received much attention for functional sensor design and anticancer drug screening, and because of their susceptibility to cause various common diseases. Additionally, organic probes possessing hydrogen bond moieties that are complementary to the target bases, such as naphthyridine, pyrazine, lumazine, pteridine, and flavin derivatives, can recognize DNA nucleobases. These label-free and cost-effective fluorescence strategies are particularly attractive for DNA nucleobase recognition and other promising applications such as aptamer sensor designs. This proposal will examine NTP's structural components, diverse biological properties, and therapeutic consequences, including cytotoxic compounds, antiviral agents, and immunosuppressive molecules. We will try to conclude the pharmaceutical and diagnostic applications of NTP modification and how fluorescent labeled receptors provide sensitive probes for studying the structure, dynamics, and interactions nucleotide analogs.

Specific recognition of such important nucleotide analogs with novel fluorophore will help to detect them in nanomolar scale and could control their bioavailability upon interaction. The controlled and specific interaction could also lead finding of novel fluorescent cavitand to encapsulate base analogs that used as drug and deliver them inside the cell in specific tissue or organs. The genetic defects (like Lesch-Nyhan Syndrome) which lead accumulation or scarcity of certain nucleotide analogs (Hypoxanthine) could also be detected by the help of these proposed fluorescent molecules. Here we are trying to design and synthesize variety of receptors for recognition of nucleobases in both solid and solution phase. We are developing different fluorogenic artificial molecular receptors, capable of binding very efficiently and very selectively with nucleobases. The modern bioorganic chemistry concerns the design of synthetic molecules that mimic various aspects of enzyme chemistry and to understand their essential roles in biological systems. After synthesizing the receptors we will try to investigate the significant selectivity and high affinity for the target molecule in organic solvent and aqueous media as well, for promising applications in biomolecule detection. The fluorimetric detection of different

biomolecules by use of artificial supramolecular receptors represents a powerful chemosensor method for the detection of medicinally and technically highly-relevant analytes.

The hydrogen bonds are used extensively as a tool to design the structure of molecular crystals, because of their strength as well as directional nature relative to other intermolecular non-covalent interaction. The understanding of the nature of non-covalent intermolecular forces responsible for molecular recognition and selectivity has become a major focus of mention in biological chemistry.

The project aims to synthesize functionalized water soluble chemosensor which have been incorporated into a large variety of fluorescent ion sensor for some important biological imaging of cellular ions. The hydroxyl-footed chemosensor have received much interest as basic molecular platforms for the construction of desired molecular architectures. The chemistry of water soluble chemosensor is well developed and their unique topology offers a wide range of scaffolds enabling them to encapsulate many different metal ions. These chemosensor potentially may serve as device for drug delivery and controlled release applications. A series of flexible, semirigid as well as rigid receptors have been prepared for substrates of biochemical significance to mimic biological events. So significant expertise is available with the research investigatorin the area of molecular recognition, design and synthesis of artificial receptors will definitely be an advantage for further developing the fluoroionophore receptor molecule. The development of new effective chemosensors is a thrust area in the modern molecular recognition research in national and international scenario for its ample applications in the medical/pharmaceutical area, analytical, environmental applications etc.
In brief the specific aims of the proposoed proposal will be as follows:

1. **Design and synthesis of key molecules in order to get water soluble chemosensors.**
2. **Synthesis of water soluble chemosensors with small cavitand and characterization for their fluorescence property upon interaction with guest molecules (biomolecules).**
3. **Understanding the permeability and toxicity of the chemosensors inside live cells.**
4. **Establishment of the newly synthesized fluorophores for their usage in live-cell imaging and bioassay to diagnose the presence of biomolecules.**
5. **Characterization of the fluorophores for their probable role to investigate the interaction of selective biomolecule in biological system and efficiently may serve its applications in the medical and pharmaceutical area.**

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